UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

July 29, 1998

Mr. Philip Otis, U.S. Department of the Navy
Northern Division - NAVFAC
10 Industrial Highway
Code 1811/PO - Mail Stop 82
Lester, PA 19113-2090

Re: Statistical Assessment by the United States Environmental Protection Agency National Exposure Research Laboratory for the Long Term Risk Monitoring Plan (LTRMP), Site 7 Calf Pasture Point
Former Naval Construction Battalion Center, Davisville, RI

Dear Mr. Otis:

Please find the subject document enclosed.

If you have any questions, or would like to set up a meeting to discuss these issues, please contact me (617) 573-5736.

Sincerely,

Christine A.P. Williams, RPM
Federal Facilities Superfund Section

Enclosure

cc: Richard Gottlieb, RIDEM
Walter Davis, NCBC
Marjory Myers, Narragansett Tribe
Marilyn Cohen, ToNK
Howard Cohen, RIEDC
Bryan Wolfenden, RI RC&DC, Inc.
Eileen Curry, Dynamac Corp.
Jim Shultz, EA Engineering Science and Technology

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EXPOSURE RESEARCH LABORATORY
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JUL 2 3 1998

OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: Statistical Assessment - Naval Construction Battalion Center S. F. Site (NCBC)

FROM: Ken W. Brown, Director, TSC
Environmental Sciences Division

TO: Christine Williams, RPM
Region I

Christine, please find attached the report titled "Review of the Proposed Statistical Approach to Determine Post-Baseline Exceedances at the Site 7 Calf Pasture Point Former Naval Construction Battalion Center (NCBC) Davisville, RI" dated July 21, 1998.

The review and attached comments were provided by Dr. Anita Singh a LMSG senior statistician. As you will note, Anita recommends that the sampling effort be extended. I hope these comments and recommendations will be helpful to you at the subject Superfund site. If you need additional explanation of the attached comments, please give me a call at (702) 798-2270.

Attachments

21 July 1998

Review of the Proposed Statistical Approach to Determine Post-Baseline Exceedances at

The Site 7 Calf Pasture Point
Former Naval Construction Battalion Center (NCBC), Davisville, RI

Ms. C. Williams, RPM, Region I, asked the technical assistance of Technical Support Center (TSC), NERL, Las Vegas, NV in reviewing the statistical plan proposed by the Navy to determine post - baseline exceedance events as described in the Conceptual Long Term Risk Monitoring Plan (LTRMP) of May 11, 1998, for the Calf Pasture Point, Site 7, NCBC, Davisville, RI .

In the proposed plan (PP), the Navy is proposing to collect baseline monitoring data for the first two years at the various discharge points of the onsite plume at the Site 7 including down-gradient of the disposal sources and discharge points within the on-site interior wetland. During the two-year baseline sampling, data will be collected at three different times to capture the seasonal effects (if any). These data should be collected from all critical discharge locations during the baseline sampling. After the baseline sampling, a 10 year annual post-baseline risk monitoring will commence. The post-baseline data will be used to identify significant upward trends (called exceedance events) at the various discharge locations. If an increasing trend is observed, then contingent remediation actions as described in Section 4.2.2 will be performed. Also, if in two consecutive annual post-baseline sampling events, no exceedances are observed, the annual sampling will be reduced to five-year sampling events as described in Section 4.2.3 of the LTRMP.

Proposed Baseline Sampling: During the initial baseline two year sampling period, data will be collected at three different sampling seasons. This means that only two data points will be available for each season from each of the monitoring wells considered.

Obviously, two data points are not enough to perform any relevant statistical comparisons, and to draw any meaningful statistical conclusions such as the occurrence of seasonal effect on the concentrations of the contaminants of concern (COCs) at the potential discharge locations. Specifically, in the present context, two data points are not enough: 1) to compare concentrations of the COC at the discharge locations during the three seasons, and consequently 2) to determine the existence of a critical season which may have the highest potential of adverse impact along potential discharge points.

Determination of a Critical Season: The baseline data should be a good representative of the existing conditions at the various monitoring discharge locations. A minimum of four data points will be needed from each season considered to determine the presence or absence of a critical season. It is therefore, recommended that the baseline sampling period be extended to a four year (rather than 2 year) sampling period. This will provide much needed confidence in the conclusions drawn based on the baseline data. Depending upon the data distribution, parametric or non-parametric procedures (Gilbert, 87) can be used compare the data from the three seasons, and to identify a critical season. This step is important since all subsequent post- baseline 10 year annual sampling will be performed during this critical season (if exists) as described in the LTRMP.

Proposed Statistical Procedure to Identify Trends in Data: In order to determine increasing trends (exceedance events), the Navy has proposed a procedure based on Kendall' s Tau statistic (Helsel and Hirsch, 1991), which is an appropriate procedure for the intended purpose provided enough data are available (e.g., data for about 8 sampling events). In case, less than 8 points are available, the Navy is proposing an alternative subjective approach (page 8, second paragraph) to determine a significant increase.

This approach is based on an approximate 30% laboratory imprecision. However, it should be noted that all measured values are subject to laboratory imprecision, which will balance out while computing the difference in two consecutive measured values. Thus, a significant increase considered as 30% of the previous measured value is an arbitrary approach without any theoretical backup. This is another reason to have a four-year baseline sampling period.

Proposed Post Baseline Sampling : A ten year post-baseline sampling should be adequate for the Site 7. However, since, initially, limited data are available, the annual sampling events should not be replaced by five- year sampling events prior to the collection of data for at least eight sampling events including the baseline period. This will allow the use adequate trend identification procedures to identify any exceedance events. In case of decreasing trend or no trend (no exceedance events) in two consecutive annual post-baseline sampling (after the collection of 8 data points), the annual sampling may be replaced by the five-year sampling as described in Section 4.2.3. An exceedance on the other hand will trigger the contingent remediation plan as described in Section 4.2.2

Recommendation

A two year baseline sampling period to establish baseline conditions at the site and to determine the existence of a critical season is not enough. It is recommended that the baseline sampling period be extended to a four year period. Appropriate statistical approaches should be used for trend identification and determination of exceedance events. Use of subjective approaches (such as determination of a significant increase by 30% of the measured value) should be avoided. After, enough data are available to use adequate statistical procedures, annual sampling may be replaced by a five-year sampling plan provided no exceedance events are observed in two consecutive annual sampling events.

References

Helsel, D.R., and Hirsch, R.M. (1991). Statistical Methods in Water Resources. Elesevier.

Gilbert, R.O. (1987). Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold.